REMARKS

Claims 1-28 are pending in this application. Claims 1, 3, 7 and 23 have been amended in several particulars for purposes of clarity and brevity that are unrelated to patentability and prior art rejections to assist the Examiner to expedite compact prosecution of the instant application.

The drawings have been objected to under 37 C.F.R. §1.84 for reasons listed on PTO-948. Formal drawings are hereby submitted to render the objection moot.

Claims 1-28 have been rejected under 35 U.S.C. §103 as being unpatentable over Heil et al, U.S. Patent No. 6,173,374 as modified to incorporate selected features from Angelo et al., U.S. Patent No. 6,061,794 for reasons stated on pages 2-13 of the Office action. Applicants respectfully submit that features of the present invention are neither taught nor suggested by either Heil '374 or Angelo '794, whether taken individually or in combination with any other references of record. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection for the following reasons.

The present invention describes a direct-call interface between Local Transport 314 and Remote Transport 316 in a driver module 310 of a host system for the purposes of exporting device access to remote devices on a data network (SAN) as shown in FIG. 3 and expressly defined in each of independent claims 1, 4, 7, 14 and 22. For example, Local Transport 314 is arranged to provide an interface to IOP 320 on the PCI bus 318 supporting an array of IO devices 326. Remote Transport 316 is arranged to provide an interface to remote devices (remote servers) via a SAN. Connection Manager 312 is utilized to establish connection services and create a direct call path between the Local Transport 314 and the Remote Transport 316 so as to provide access to IO

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devices 326. Data structure pointers as shown in FIG. 4 are exchanged between the Local Transport 314 and the Remote Transport 316 by way of the Connection Manager 312 in order to establish a direct-call relationship between separately installed software modules.

The driver module system 310 is initialized as defined by independent process claim 23 as follows: The Local Transport 314 scans the PCI bus 318 to locate and initialize all local IOPs and builds an opaque "context" structure for each IOP found. The Remote Transport 316 then prepares to accept requests through network interface card (NIC) 328. The Connection Manager 312 then queries the Local Transport 314 to determine the number of IOPs and builds a descriptor structure for each IOP (IOP descriptor structure includes an exported table of function call pointers and the context required by the Local Transport 314 to communicate with the IOP), and establish a management communication channel through the Remote Transport 316, which waits for an external connection from a remote server via a SAN for exporting local device access using said direct call path between the Local Transport 314 and the Remote Transport 316.

This driver module system 310 allows, for example, a distributed database running on a cluster of servers to share and directly access all the storage in the cluster transparently. As a result, the overhead incurred by the OS stack on the remote node is avoided via "short-circuiting" at the driver level. In addition, it is no longer necessary for the database to generate special application-to-application messages to remote nodes in order to access IO devices located on remote storage.

In contrast to Applicants' independent claims 1, 4, 7, 14, 22 and 27, Heil '374 as a primary reference discloses the use of one or more host bus adapters HBA 112 as shown in FIG. 2 and 180, 181 as shown in FIG. 5A installed in a host system of a clustered computer network for processing

IO requests received from the host system. Each HBA also serves as a network interface card (NIC) connected to a peer HBA via a Fibre Channel backbone 121 (high-speed communication medium) and contains therein a directory within memory 116 for storing location information regarding blocks of data stored in storage devices and software for searching the directory to determine whether to locally or remotely retrieve blocks of data. The HBA installed in one node of a clustered computer network is operable to establish and maintain communications with at least one other HBA installed in another node of the clustered computer network.

There is **no** disclosure anywhere from Heil '374 of Applicants' claimed "host driver module" installed in a host system which comprises "a Local Transport arranged to provide an interface to an input/output platform (IOP) supporting an array of input/output devices;" "a Remote Transport arranged to provide an interface to said another system;" and "a Connection Manager arranged to establish connection services and to create a direct call path between the Local Transport and the Remote Transport so as to provide access to IO devices" as generally defined in claims 1, 4, 7, 14, 22 and 27.

Nevertheless, the Examiner asserts, in support of the rejection of claim 23, that,

> Heil ['374] discloses an access module including a processor(s) associated memory, and a local memory bus, and an input/output bus forming an input/output platform (IOP) access module (Fig. 1-5A, col 6/lines 34-64), module for providing input/output device access between a host system and another system (col 3/lines 64-col 4/line 29), module arranged to establish a service connection to a local (IOP) connected to a local bus using a driver module in response to a request from a remote server on a computer system network, establishing connection process comprising the steps of: beginning initialization of said driver module (col 12/lines 26-37, Fig. 4A-4D, steps 500, 510, 518, 529) which provides access to a local storage system while bypassing protocol stacks of a host operating system (providing a direct request call access while bypassing OS specific portion layer, bypassing 250, 260

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access means independent of OS, Fig. 2, col 10/lines 28-65), said driver module comprising a module 180 (Local Transport) which provides direct access to the local storage device system (col 4/lines 3-20), a module 181 (Remote Transport) which interfaces to other nodes of said system network (col 4/lines 21-29, Fig. 5A remote node N), and connection means (Connection Manager) which provides connection services and coordinating functions responsible for creating a direct call path between the Local Transport and the Remote Transport (direct path between the module 118 and the module 181 so as to provide access to input/output (117.8 and 117.9) devices driver coupled to local storage (Fig. 5A, 118) devices); searching process (scanning) to locate and initialize all local input/output platforms (IOPs) peer HBA modules, and building an IOP context directory structure (map) (i.e. descriptors and addresses of routines located with a region of memory) for each input/output platform (IOP) found responsive (col 12/lines 9-col 13/line 3); (managing, making arrangements for, i.e. preparing) means to take, be given, receive (i.e. accept) a request for a service connection from said remote server on said system network (col 11/lines 36-53, col 12/lines 9-19, Fig. 3); query via scanning means itemize responsive input/output IOP on build map (col 11/lines 53-col 65, col 12/lines 8-59), and building a descriptor structure for each IOP which includes an exported directory table having function call (col 13/lines 5-15) address pointer and characteristic parameters to support communication with the input/output platform (IOP) found (col 12/lines 9-col 13/line 13); and establishing a communication channel through the Remote Transport, which waits for an external connection from said remote server on said system network for shipping (exporting) local device access resources onto said system network using said direct call path between the Local Transport and the Remote Transport (col 10/lines 28-65).

The Examiner has expressly admitted that,

> Heil ['374] does **not** teach an access module arranged to establish a service connection to a local input/output platform (IOP) running on host server of particular system area network and establishing a associated system area network management communication channel; nor module (180) arranged to provide an interface to an input/output platform (IOP) supporting an array of input/output devices is denoted "Local Transport", nor module (I 8 1) arranged to provide an interface to said another system is denoted "Remote Transport".

However, the Examiner cites Angelo '794 for allegedly disclosing these features in order to

arrive at Applicants' claim 23. Unfortunately neither Heil '374 nor Angelo '794 discloses the

features as the Examiner has alleged. Virtually all the citations from either Heil '374 or Angelo '794

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are misplaced. Even more puzzling is the fact that no where in Angelo '794 is there disclosure of any module denoted as "Local Transport" and "Remote Transport" as identified by the Examiner as lacking from Heil '374.

For example, the cited col. 6, lines 34-64 of Heil '374 for allegedly disclosing Applicants' claimed "service connection to a local input/output platform (IOP) connected to a local bus using a driver module" as defined in claim 23 is incorrect. That cited portion of Heil '374 simply depicts a host system as shown in FIG. 1 including essential components such as CPU 100, cache 105, processor bus 110, host-to-PCI bus bridege 115 and a PCI bus 116. No reference to any input/output platform (IOP) as defined in claim 23, see FIG. 3.

The cited col. 4, lines 3-20 of Heil '374 for allegedly disclosing Applicants' claimed "module (Local Transport) which provides direct access to the local storage system" is also incorrect. That cited portion of Heil '374 describes a host bus adapter (HBA) which is a hardware component adapted to connect a host system to an IO device as well as to connect to a Fibre Channel backbone. The HBA of Heil '372 is analogous to the SAN network interface card (NIC) 328 shown in FIG. 3 of the disclosed invention. In contrast to the HBA of Heil '372, Applicants' claimed "Local Transport" is a part of the driver module along with the Remote Transport and the Connection Manager and is arranged to provide an interface to an IOP supporting an array of IO devices.

The cited col. 4, lines 21-29, FIG. 5A of Heil '374 for allegedly disclosing Applicants' claimed "module (Remote Transport) which interfaces with other nodes of said system network" is also incorrect. That cited portion of Heil '374 describes how the host bus adapter (HBA) which

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is a hardware component installed in each node of a Fibre Channel is able communicate among each other as peers. Again, **no** disclosure of any "Remote Transport".

More importantly, no attempt to cite any portion from either Heil '374 or Angelo '794, and none is found for disclosing Applicants' claimed "Connection Manager which provides connection services and coordinate functions responsible for creating **a direct call path between the Local Transport and the Remote Transport**."

The cited col. 12, line 9 extending to col. 13, line 13 of Heil '374 for allegedly disclosing Applicants' claimed "building [an IOP] descriptor structure for each input/output platform (IOP) which includes an exported table of function call pointers and the context required by the Local Transport to communicate with the input/output platform (IOP)" is likewise incorrect. That cited portion of Heil '374 only describes how the host system and the HBA are initialized and how the HBAs build a local directory containing the mapped location information for respective local storage subsystems 504. The Examiner asserts that Applicants' claimed IOP descriptor structure as shown in FIG. 4 is analogous to the use of an HBA directory (map) (i.e. descriptors and addresses of routines located with a region of memory). However, this assertion is completely flawed. Applicants' claimed "IOP descriptor structure" is established for a direct call interface between the Local Transport 314 and Remote Transport 316 in order to access to each IOP. In contrast to Applicants' claimed "IOP descriptor structure" the HBA directory of Heil '374 is used to map location information of local storage subsystems. Therefore, no IOP descriptor structure is disclosed by Heil '374.

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Regarding independent claims 1, 7 and 14, the Examiner asserts that Heil '374 further

discloses,

> an access module, module including a processor(s) associated memory, and a local
> memory bus, and an input/output bus, i.e., an input/output platform access module
> (Heil: Fig. 1-5A, col 6/lines 34-64), a module for providing input/output device
> access between a host system and another system (Heil: col 3/lines 64-col 4/ line 29)
> comprising: a module (Heil: Fig. 5A, 180) arranged to provide interface (Heil: Fig.
> 1, 117.8, 117.9) means to an input/output platform (IOP) supporting an array of
> input/output (118) storage devices (Heil: col 4/lines 3 -20); a module (Heil: Fig. 5A,
> 181) arranged to provide an interface (Heil: Fig. 5A, 120) means to said another
> system node (Heil: Fig 5A and 1 (151), col 4/lines 21-29); and module comprising
> (Heil: Fig. 5A, 171) arranged to establish connection services and to create a direct
> call path between the module 118 and the module 181 so as to provide access to
> input/output (117.8 and 117.9) devices driver coupled to local storage (Heil: Fig. 5A,
> 118) devices.

Evidently, none of the cited portions of Heil '374 discloses what the Examiner has alleged.

For example, the cited col. 6, lines 34-64 of Heil '374 does not disclose any "service connection to

a local input/output platform (IOP) connected to a local bus using a driver module" as defined in

claim 23. Rather, that cited portion of Heil '374 simply depicts a host system as shown in FIG. 1

including essential components such as CPU 100, cache 105, processor bus 110, host-to-PCI bus

bridege 115 and a PCI bus 116. Similarly, the cited col. 4, lines 3-20 of Heil '374 does NOT

disclose any claimed "module (Local Transport) which provides direct access to the local storage

system". Rather, that cited portion of Heil '374 only describes a host bus adapter (HBA) which is

a hardware component adapted to connect a host system to an IO device as well as to connect to a

Fibre Channel backbone. Likewise, the cited col. 4, lines 21-29, FIG. 5A of Heil '374 does NOT

disclose any claimed "module (Remote Transport) which interfaces with other nodes of said system

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network". Instead, that cited portion of Heil '374 only describes how the host bus adapter (HBA) which is a hardware component installed in each node of a Fibre Channel is able communicate among each other as peers. Furthermore, the cited FIG. 5A, element 171 of Heil '374 does NOT disclose any claimed "Connection Manager which provides connection services and coordinate functions responsible for creating **a direct call path between the Local Transport and the Remote Transport**" as defined in claim 1. Rather, element 171 is simply a front-end interface as shown in FIG. 5A for providing an interface to a PCI bus 116.5. There is no disclosure of any "Connection Manager" whatsoever.

Regarding dependent claims 4, 15 and 24, the Examiner asserts that the combined teachings of Heil '374 and Angelo '794 further teach,

> wherein said IOP which comprises: at least one or mo're input/output processors (Heil: col 9/lines 49-59, element (114.9); at least one storage device as said input/output devices (col 6/lines 65-col 7/line 4, col 7/lines 51-56); a device driver module arranged to control access via interface means with said storage device (Heil: col 7/line 1-56); a communication layer which defines a mechanism for communications between the Local Transport and the device driver module (Heil: col 10/lines 66-col 11/line 11, 45-53, element (240)).

Again, none of the cited portions of Heil '374 discloses what the Examiner has alleged. This is because no where in Heil '374 is there disclosure of any IOP as defined in claims 4, 15 and 24. Therefore, the cited portions of Heil '372 do NOT disclose the specific configuration of an IOP as comprising one or more IO processors, IO devices, a device driver module and a communication layer which defines a mechanism for communications between the Local Transport and the device driver module.

Regarding dependent claims 5, 9, 16 and 25, the Examiner asserts that the combined

teachings of Heil '374 and Angelo '794 further teach,

> wherein said communication layer is responsible for managing all service requests
> (Heil: col 11/lines 36-53, cot 12/lines 9-19) and providing a set of software
> comprising used to initiate communication with a network services via peer-to-peer
> communication or call services (i.e. APIs), (Heil: col 9/lines 11-18) for delivering
> messages, along with a set of support routines that process the messages (Heil: col
> 8/lines 24-49).

Again, if Heil '374 does NOT disclose any IOP as defined in claims 4, 15 and 24, then there

is no possibility of any disclosure from Heil '374 of any claimed "communication layer [of an IOP]

for managing all service requests and providing a set of Application Programming Interfaces (APIs)

for delivering messages, along with a set of support routines that process the messages" as defined

in claims 5, 10, 16 and 25.

Regarding dependent claims 6, 10, 16 and 25, the Examiner asserts that the combined

teachings of Heil '374 and Angelo '794 further teach,

> wherein said communication layer comprises a message layer which sets up a
> communication session (Heil: col 11/lines 66-col 11/line 11, 45-53), and a transport
> layer which defines how information will be shared (Heil: col 10/lines 66-col 11/line
> 11, coordinate retrieval of shared information).

Again, if Heil '374 does NOT disclose any IOP as defined in claim 4, then there is no

possibility of any disclosure from Heil '374 of any claimed "communication layer [of an IOP] which

sets up a communication session, and a transport layer which defines how information will be

shared" as defined in claims 6, 10, 16 and 25.

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Regarding dependent claim 11, the Examiner asserts that the combined teachings of Heil '374 and Angelo '794 further teach,

> wherein said system driver module and said device driver module constitute a single device (Heil: col 4/lines 3-4) that is operable independent of the host operating system and operable at any different host computer (i.e. portable) across a plurality of operating systems and host network platforms (Heil: col 4/lines 13-29), and works interoperably with a plurality of storage devices and operating systems (Heil: col 4/lines 4-20).

Again, none of the cited portions of Heil '374 discloses what the Examiner has alleged. This is because no where in Heil '374 is there disclosure of any "Local Transport" and "Remote Transport" as defined in independent claim 9. Similarly, no where in Heil '374 is there disclosure of any combination of "system driver module" and "device driver module" as defined in independent claim 9. Therefore, the cited col. 4, lines 3-4 of Heil '372 simply describes the use of a host bus adapter (HBA).

Regarding dependent claims 20, 26 and 27, the Examiner asserts that the combined teachings of Heil '374 and Angelo '794 further disclose,

> wherein said Local Transport further has a send means and said Remote Transport further has a receive means which are respective program interfaces for receiving an receiving message from a remote server on said computer network for direct access to local input/output platform and for delivering an sending message to said remote server on said computer network (Angelo: receiving means-. col 2/lines 4-14, col 2/line 66-col 3/line 10, 41-48, sending means, col 3/lines 1 1-2 1).

Again, if Heil '374 and Angelo '794 do NOT disclose any "Local Transport" and "Remote Transport" as defined in claims 19 and 23, then there is no possibility of any disclosure from Heil

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'374 or Angelo '794 of any claimed "send handler function" and "receive handler function which are respective program interfaces for receiving an inbound message from a remote server on said computer network for direct access to local input/output platform and for delivering an outbound message to said remote server on said computer network" as expressly defined in claims 20, 26 and 27.

The law under 35 U.S.C. §103 is well settled that "obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." *ACS Hospital System, Inc v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). The Examiner must point to something in the prior art that suggests in some way a modification of a particular reference or a combination of references in order to arrive at Applicants' claimed invention. Absent such a showing, the Examiner has improperly used Applicants' disclosure as an instruction book on how to reconstruct to the prior art to arrive at Applicants' claimed invention.
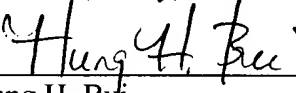
In the present situation, neither Heil '374, nor Angelo '794 discloses and suggests Applicants' claims 1-28. Therefore, Applicants respectfully request that the rejection of claims 1-28 be withdrawn.

In view of the foregoing amendments, arguments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicants' attorney at the Washington DC area office at (703) 312-6600.

Attached hereto is a marked-up version of the changes made to the claims. The attached

page is captioned "**Version with markings to show changes made**."

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. §1,136.

Applicants have submitted fees for the claims added by this Amendment. Please charge any

shortage of fees due in connection with the filing of this paper, including extension of time fees, to

the Deposit Account of Antonelli, Terry, Stout & Kraus, No. 01-2135 (Application No.

219.36435X00), and please credit any excess fees to said deposit account.

Respectfully submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please amend claims 1, 3, 7 and 23, as follows:

1   1. (Amended) An input/output platform (IOP) access module for providing input/output

2   device access between a host system and another system, via a data network, said IOP access

3   module comprising:

4   a Local Transport arranged to provide an interface to an input/output platform (IOP)

5   supporting an array of input/output devices;

6   a Remote Transport arranged to provide an interface to said another system, via said data

7   network; and

8   a Connection Manager arranged to establish connection services and to create a direct call

9   path between the Local Transport and the Remote Transport so as to provide access to input/output

10   devices.

1   3. (Amended) The input/output platform (IOP) access module of claim 1, wherein said host

2   system corresponds to a host server, said another system corresponds to any one of remote servers,

3   via said data network [with said host server and said remote servers being arranged on a computer

4   network].

1   7. (Amended) A host system, comprising:

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2   a processor;

3   an array of storage devices;

4   a driver module for exporting local storage device access onto a computer network, said

5   driver module comprising:

6   a device driver module arranged to provide an interface to said array of local storage

7   devices;

8   a host driver module arranged to provide an interface to an operating system, said

9   [system] <u>host</u> driver module comprising a Local Transport which communicates with the

10   device driver module, a Remote Transport which provides an interface to said computer

11   network, and a Connection Manager which establishes connection services with remote

12   systems on said computer network and [which creates] <u>coordinates functions responsible for</u>

13   <u>creating</u> a direct call path between the Local Transport and the Remote Transport to provide

14   access to said storage devices; and

15   a communication layer which supports communications between the host driver

16   module and the device driver module.

1   23. (Amended)   A process of establishing a service connection to a local input/output

2   platform (IOP) connected to a local bus using a <u>system</u> driver module in response to a request from

3   a remote server on a system area network, comprising the steps of:

4   beginning initialization of said driver module which provides access to a local storage system

5   while bypassing protocol stacks of a host operating system, said <u>system</u> driver module comprising

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6   a Local Transport which provides direct access to the local storage device system, a Remote

7   Transport which interfaces to other nodes of said system area network, and a Connection Manager

8   which provides connection services and [coordinating] <u>coordinates</u> functions responsible for creating

9   a direct call path between the Local Transport and the Remote Transport;

10   scanning, at said Local Transport, the local bus to locate and initialize all local input/output

11   platforms (IOPs), and building an IOP context structure for each input/output platform (IOP) found;

12   preparing, at said Remote Transport, to accept a request for a service connection from said

13   remote server on said system area network;

14   asking, at said Connection Manager, whether said Local Transport determines the number

15   of input/output platforms (IOPs), and building a descriptor structure for each input/output platform

16   (IOP) which includes an exported table of function call pointers and the context required by the

17   Local Transport to communicate with the input/output platform (IOP); and

18   establishing a system area network management communication channel through the Remote

19   Transport, which waits for an external connection from said remote server on said system area

20   network for exporting local device access onto said system area network using said direct call path

21   between the Local Transport and the Remote Transport.